OSRAM
Opto Semiconductors

OSLON® Compact — Details on handling and processing

Application Note

Valid for:
OSLON® Compact CM / CL / PL single

Abstract

This application note provides information on handling and processing of the OSLON® Compact CM and the OSLON® Compact CL (Lx CEUx) as well as the new single chip OSLON® Compact PL (Kx CELNM1/Kx CELNM2).

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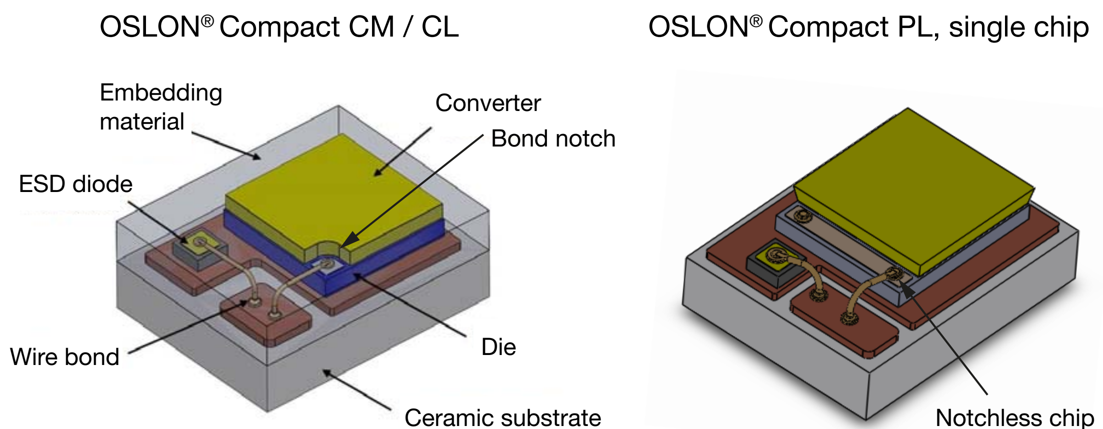
A. Design of the OSLON® Compact

The OSLON® Compact is especially developed for use as small size high-flux light source with operating currents between 50 mA and 1.5 A constant current depending on the respective device and with focus on slim designs in automotive applications.

The design of the LED consists of a ceramic substrate on which a highly efficient semiconductor chip is mounted and electrically connected. In addition, the LED features an ESD protection diode, which provides ESD stability of up to 8 kV according to ANSI/ESDA/JEDEC JS-001 - HBM, Class 3B. The rest of the small size package consists of a white embedding material. The electrical contacts are located underneath the ceramic substrate (Figure 1).

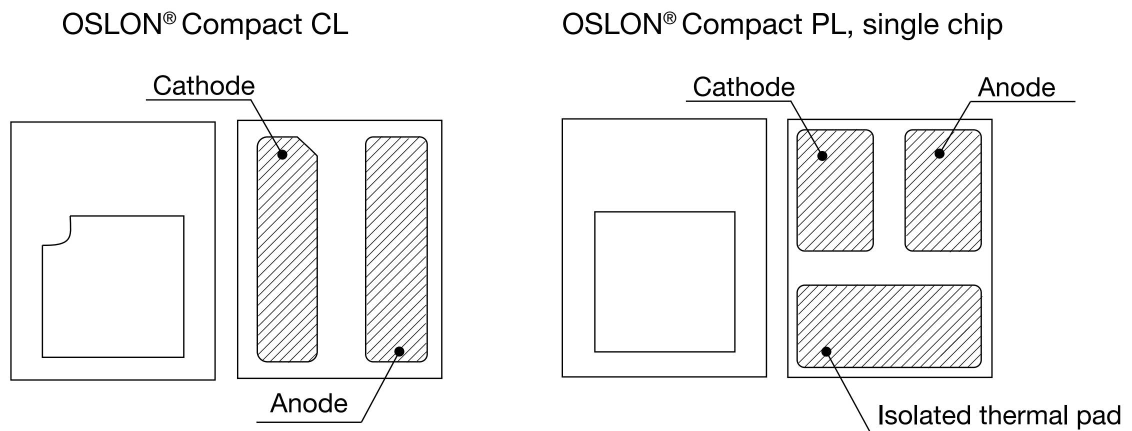
Figure 1: Design of the OSLON® Compact



The OSLON® Compact CM (LUW CEUN) has the smallest package, with dimensions of 1.2 mm x 1.6 mm and provides an operating range of 50 mA to 700 mA. In contrast, the OSLON® Compact CL (Lx CEUP) or PL (Kx CELNM1/ Kx CELNM2) have a package size of 1.5 mm x 1.9 mm. While the OSLON® Compact CL LEDs have a chip with bond notch, the new powerful OSLON® Compact PL comes with a notchless chip (see Figure 1 and 2). Both, the CL and the PL are available in White and Converted yellow.

Figure 2 shows the solder pad designs of the OSLON® Compact family. In contrast to the solder pads of the CM and CL LEDs, the OSLON® Compact PL provides an additional isolated thermal pad for improved thermal performance.

Figure 2: Solder pad design of the OSLON® Compact LEDs



As with all LEDs from OSRAM Opto Semiconductors, the OSLON® Compact also fulfills the current RoHS guidelines (European Union & China).

B. Handling

In addition to general guidelines for the handling of LEDs, additional care should be taken that mechanical stress and particularly, stresses (e.g. shear-forces) to the surface of the embedding material are avoided.

This means, for example, that the LED must not be picked up or handled by the white encapsulant, especially with normal tweezers. During the handling, any type of sharp object (e.g. forceps, fingernails, etc.) should be avoided in order to prevent stress or damage to the encapsulant, since this can lead to impairment of the component.

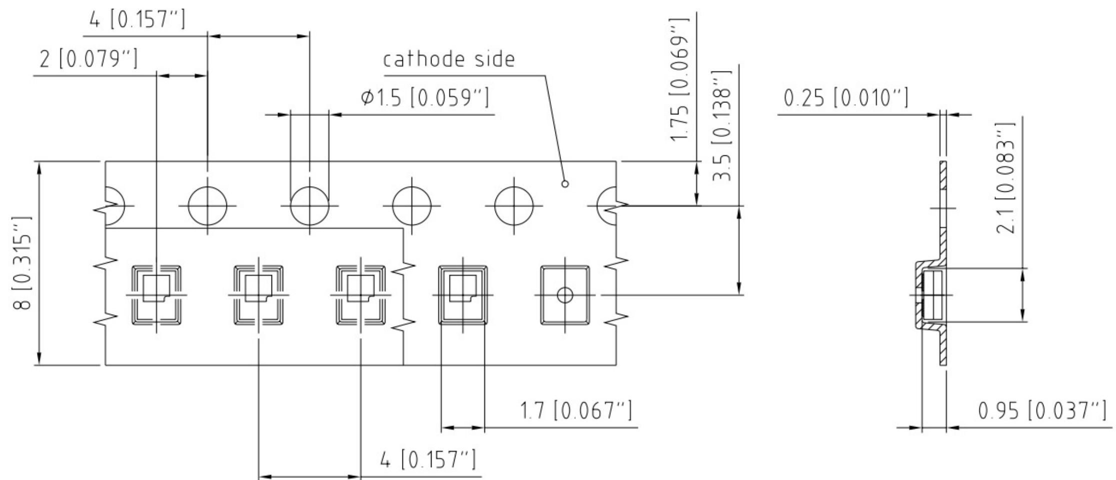
Please note even after being soldered on the PCB board any mechanical stress or touching of the embedding material must be avoided.

Care should be taken as well to ensure that no other components (e.g. additional optics) in the application are mounted flush with the sensitive encapsulant of the LED.

When placing the LED into operation, it should be ensured that sufficient cooling is provided. Depending on the given circumstances, extended operation without heat dissipation can lead to overheating, damage or failure of the component.

As can be seen in Figure 3, the OSLON® Compact is packaged in tape and on reel.

Figure 3: Position of the LED in the tape — method of taping



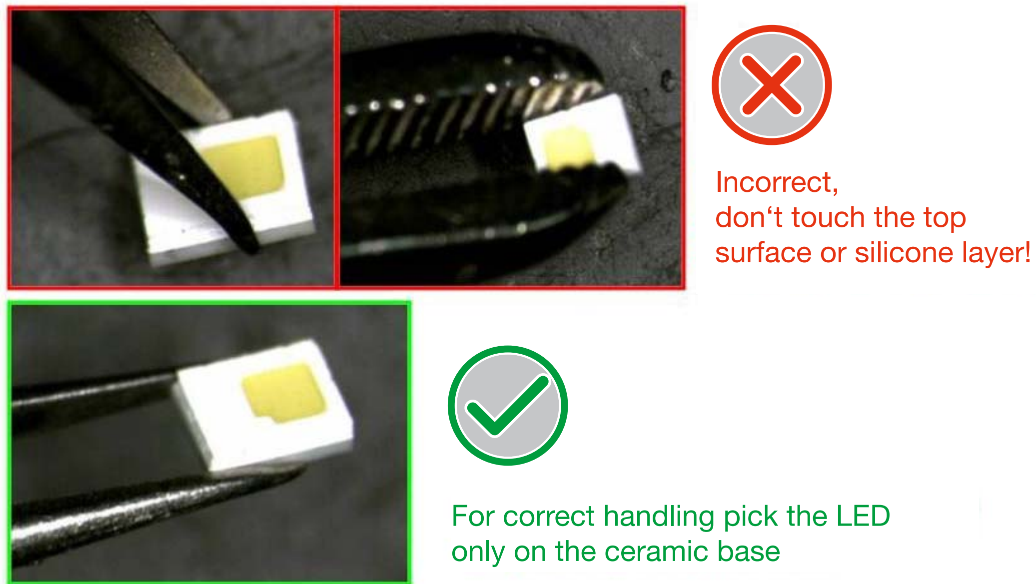
Removing the LED from the tape using simple tweezers must be avoided since this can cause damage to the housing due to forces on the side or edges of the silicone encapsulant. For manual assembly and placement – in the production of prototypes, for example — the use of so-called vacuum tweezers is recommended (Figure 4).

Figure 4: Examples of vacuum styluses

The effective mechanical stress on the LED is minimized by individually exchangeable soft rubber suction tips.

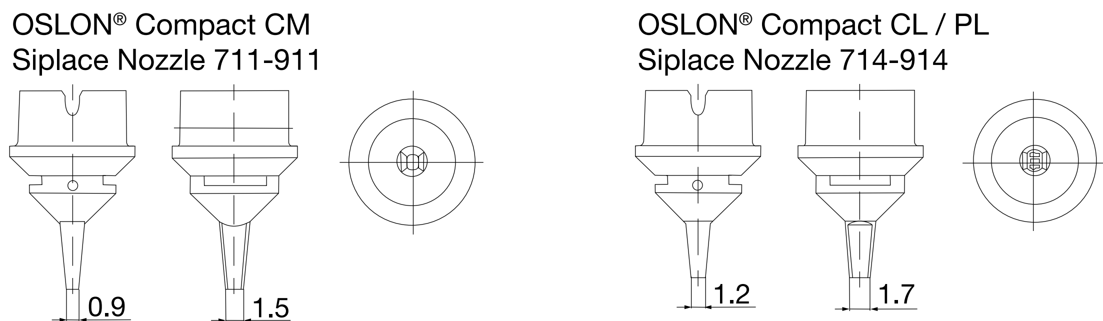
If there is no alternative to the exceptional use of a tweezers, the LED must be picked and handled only at the ceramic substrate (Figure 5).

Figure 5: Handling of the OSLON® Compact



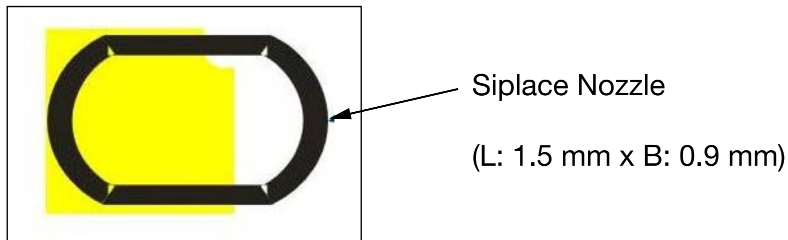
When processing by means of automated placement machines, care should be taken to use an appropriate pick and place tool and to ensure that the process parameters conform to the package's characteristics. Figure 6 shows the recommended design of the placement tool for damage-free processing of the OSLON® Compact LEDs.

Figure 6: Recommended design of the pick and place tool for the OSLON® Compact (dimensions in mm)



If possible, the tool should pick up the LED across the entire surface or along the converter rim (Figure 7). The same applies when depositing or placing the LED. Forces should be applied over the entire surface or along the converter rim.

Figure 7: Recommended pick-up area for the SIPLACE nozzle #911



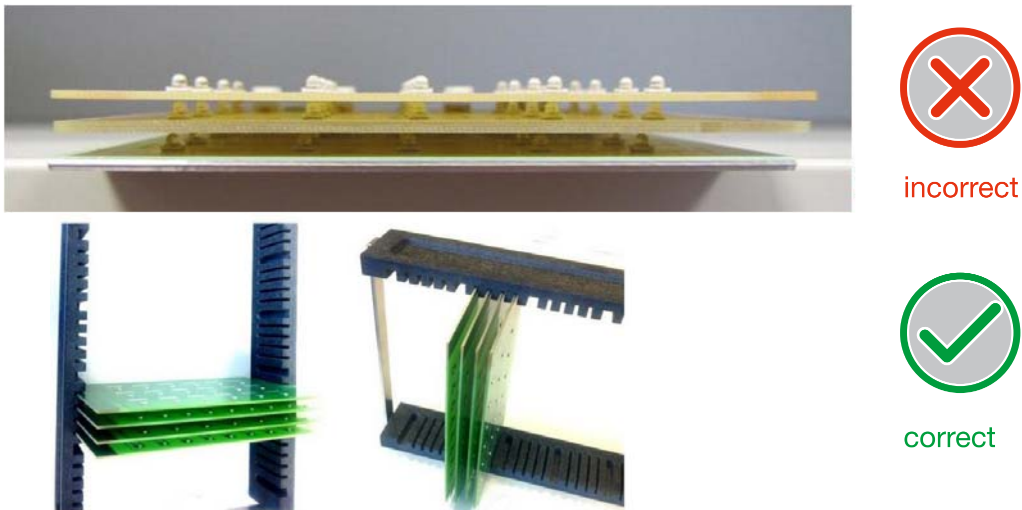
Use of an unadapted tool (e.g. with too small dimensions) can lead to cracks or conchoidal fracture of the encapsulant, especially when placing the LED.

Since the OSLON® Compact is generally supplied in tape with dry pack, it should be factory-sealed when stored. The hermetic pack should only be opened for immediate mounting and processing, after which the remaining LEDs should be repacked according to the moisture level in the data sheet (q.v. JEDEC J-STD-033B.1 - Moisture Sensitivity Levels).

C. Storage

PCBs or assemblies containing LEDs should not be stacked such that force is applied to the LED, or should not be handled directly at the LED. Generally, all LED assemblies should be allowed to return to room temperature after soldering, before subsequent handling, or the next process step

Figure 8: Storage of assemblies with LEDs



D. Cleaning

From today's perspective any direct mechanical, wet or chemical cleaning of the OSLON® Compact LEDs is forbidden.

For dusty or slightly dirty LEDs, a simple cleaning by means of compressed air (e.g. central supply or spray can) is recommended here.

E. Processing

Generally, ceramic LEDs are compatible with existing industrial SMT processing methods, so that current populating techniques can be used for the mounting process. The individual soldering conditions for each LED type according to JEDEC can be found in the respective data sheets.

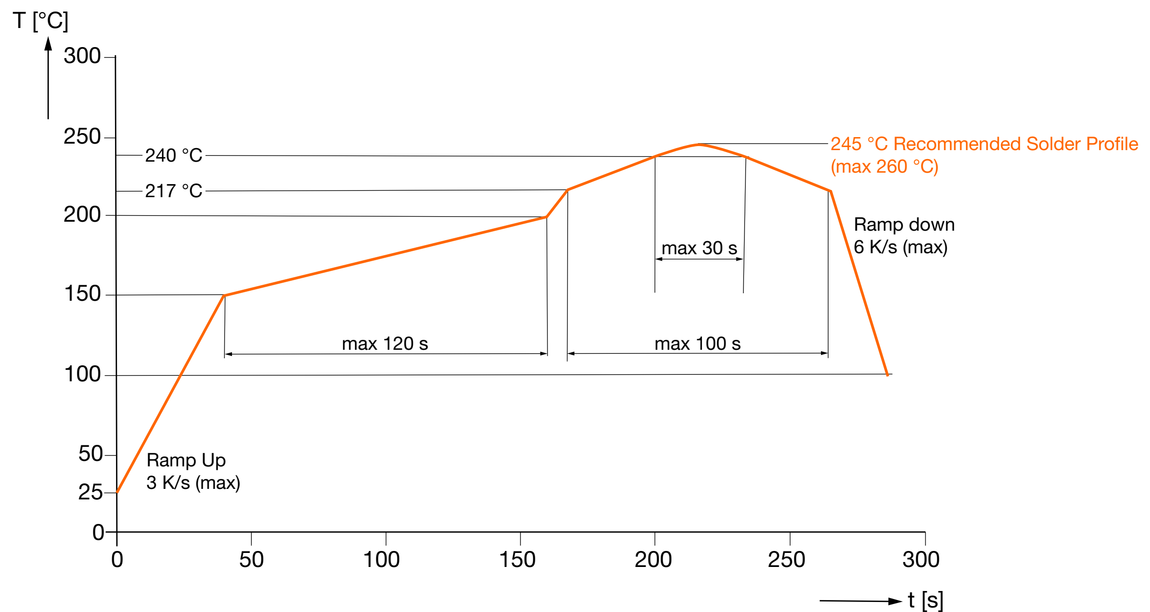
A standard reflow soldering process with forced convection under standard N_2 atmosphere is recommended for mounting the component, in which a typical lead-free SnAgCu metal alloy is used as solder. Figure 10 shows the temperature profile for lead-free soldering with the recommended peak temperature of 245 °C.

In this context, it is recommended to check the profile on all new PCB materials and designs. As a good starting point, the recommended temperature profile provided by the solder paste manufacturer can be used. The maximum temperature for the profile as specified in the data sheet should not be exceeded, however.

When developing the circuitry, special attention should be given to the position and orientation of the LED on the circuit board. Depending on the position and orientation of the LED, the mechanical stress on the LED can vary. In general, it is recommended that all twisting, warping, bending and other forms of stress to the circuit board should be avoided after soldering in order to prevent breakage of the LED housing or solder joints. Therefore, separation of the circuit boards should not be done by hand, but should exclusively be carried out with a specially designed tool.

For further information such as regarding PCB type, solder pad, solder stencil, voids, post reflow inspection and verification of the design please see also application notes “Handling and processing details for ceramic LEDs” and “Processing of SMD LEDs”.

Figure 9: Temperature profile for lead-free reflow soldering according to JEDEC JSTD-020



F. Summary

Due to its design and small dimensions the manual handling and assembly of the OSLON® Compact is delicate especially with simple tweezers, since the LED must be picked and handled only at the very thin ceramic base. Please note that no mechanical impact on the encapsulant is allowed. In general it should also be kept in mind that the LED is not suitable for any direct mechanical, wet or chemical cleaning. OSRAM Opto Semiconductors supports its customers during their development and design process in finding the best solution for a specific application.

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ABOUT OSRAM OPTO SEMICONDUCTORS

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